Claims

1. A graphical data-compressor for compression of received, arbitrary graphical data for subsequent transmission; said graphical data-compressor comprising

an input for reception of said received arbitrary graphical data,

an analyzer linked to said input and operable for analysis of said received arbitrary graphical data into constituent geometrical parts,

a scene describer, linked to said analyzer for description of at least some of said constituent geometrical parts as a functional description of said received arbitrary graphical data, and

a transmitter linked to said functional scene describer for transmission of said analytic description.

2. A graphical data-compressor as claimed in claim 1, further comprising an indexer positioned between said analyzer and said transmitter, for indexing said analytic description into an indexed description.

3. A graphical data-compressor as claimed in claim 1 wherein said arbitrary graphical data is in a format selected from a polygonal graphic representation, a point cloud, an ordered piecewise mesh, or (piecewise) polynomial and rational forms and polynomial, rational and freeform functions.

4. A graphical data-compressor as claimed in claim 1 wherein said analyzer for analysis of said graphical data into constituent geometrical parts comprises a pattern matcher

5. A graphical data-compressor as claimed in claim 1 wherein said constituent geometrical part is a predetermined shape, and said analytic description comprises a functional representation of said predetermined shape.

6. A graphical data-compressor as claimed in claim 1 wherein said functional representation comprises a basic underlying shape together with parameters.

7. A graphical data-compressor as claimed in claim 6 wherein said received arbitrary input data comprises a plurality of data points in space.

8. A graphical data-compressor as claimed in claim 7 wherein said input comprises an applicator for applying a surface fitting function to fit said plurality of data points in space, thereby to represent said plurality of data points in a format suitable for said analyzer.

9. A graphical data-compressor as claimed in claim 8 wherein said surface fitting function is selected from any one of a group comprising Bezier freeform functions, B-spline freeform functions, NURBS, piecewise polynomial equations and rational equations.

10. A graphical data-compressor as claimed in claim 5, wherein said predetermined shape is selected from any one of a group comprising lines, curves, planar freeform surfaces, surfaces of revolution, spherical faces, conical faces, cylindrical faces, torroidal faces, ruled surfaces, extrusion surfaces, sweep surfaces, additive combinations thereof and trimmed combinations thereof.

11. A graphical data-compressor as claimed in claim 11 wherein said scene describer is operable to select said predetermined shape for said constituent geometrical part by analysis of said constituent geometric part to determine fulfillment of conditions associated with said predetermined shape.

12. A graphical data-compressor as claimed in claim 10 wherewith said predetermined shape is modifiable by trimming.

13. A graphical data-compressor as claimed in claim 5, wherewith said functional description comprises at least a label of an underlying shape

and parameters for adapting said underlying shape to reconstruct an original shape.

14. A graphical data compressor as claimed in claim 13, wherein said parameters comprise at least one of a group comprising an orientation, a scale, dimensional parameters and a location.

15. A graphical data-compressor as claimed in claim 14 wherewith said label is an index.

16. A graphics decompressor comprising

a receiver for reception of graphical data in a compressed, functional form,

a geometry evaluator, following said receiver, for evaluation of said graphical data in respect of a predetermined set of basic shapes stored at said decompressor, and

a piecewise linear surface approximator following said geometry evaluator, for reconstruction of said evaluated data on a piecewise basis, into geometrical entities.

17. A graphics decompressor as claimed in claim 16, wherein said compressed functional form comprises elements having a basic shape associated with parameters.

18. A graphics decompressor as claimed in claim 17, wherein said reconstruction into geometrical entities is at a selectable resolution level.

19. A graphics decompressor as claimed in claim 18, said resolution level being selectable in accordance with a context of the data within a scene.

20. A graphics decompressor as claimed in claim 19, said context being a relationship of the data to a background and a foreground within the scene.

21. A graphics decompressor as claimed in claim 18, said selectable resolution level being determinable by available computer resources.

22. A graphics decompressor as claimed in claim 18, said available computer resources being any one of a group comprising memory availability, processor capability, and available processing time.

23. A graphics decompressor as claimed in claim 17 wherein said predetermined shape is selected from a list comprising lines, curves, planar freeform surfaces, surfaces of revolution, spherical faces,

conical faces, cylindrical faces, torroidal faces, ruled surfaces, extrusion surfaces and sweep surfaces.

24. A graphics decompressor as claimed in claim 16 wherein each of said basic shapes in said set are trimmable with a further basic shape from said set.

25. An analytic form describer, for describing constituent geometrical parts of arbitrary graphical data as an analytic description; said analytic form describer comprising

a register of predetermined basic geometrical elements, and

an analytic form fitter for associating said predetermined basic geometrical elements with said geometrical parts.

26. An analytic form describer as claimed in claim 25, wherein said predetermined basic geometrical elements are selected from a group comprising lines, circles, planar surfaces, spherical surfaces, conical surfaces, cylindrical surfaces, torroidal surfaces, surfaces of revolution, ruled surfaces, extrusion surfaces and sweep surfaces, and additive and trimmed combinations thereof.

27. An analytic form describer as claimed in claim 25, wherein said analytic form fitter further comprises functionality for fitting said

constituent geometrical parts of arbitrary graphical data with functions selected from a group comprising Bezier and B-spline functions, B-splines, polynomial and piecewise polynomial rational equations.

28. A system for analysis, compression, transmission and decompression of arbitrary graphical data, the system comprising:

a graphical data-compressor for compression of received, arbitrary graphical data, said graphical data-compressor comprising:

an input for reception of arbitrary graphical data,

an analyzer, linked to said input, for analysis of said received arbitrary graphical data into constituent geometrical parts,

a describer, linked to said analyzer, for description of said constituent geometrical parts as an analytic description,

a transmitter, linked to said analyzer, for transmission of said analytical description over a data link;

said system further comprising a graphical data decompressor for decompression of said functional description into geometric entities, the decompressor comprising:

a receiver for reception of said functional description from said data link, and

a geometry evaluator for evaluating said functional description in terms of basic geometric shapes, thereby to decompress said compressed graphical data descriptions.

29. A system as claimed in claim 28, further comprising an indexer linked between said analyzer and said transmitter, said indexer for indexing said analytic description into an indexed description.

30. A system as claimed in Claim 28 wherein said decompressor further comprises a piecewise linear surface approximator.

31. A system as claimed in claim 28, wherein said data link is selected from a group comprising: a LAN, WAN, the Internet, a dedicated land link, a dedicated link through the atmosphere, a radio-wave link, and a microwave link.

32. A method for compressing arbitrary graphical data comprising:

analyzing said arbitrary graphical data into constituent geometrical parts,

describing said constituent geometrical parts as functional description of said constituent geometrical parts of said arbitrary graphical data, and

transmitting said functional description.

33. A method for compressing arbitrary graphical data as claimed in claim 32, comprising indexing said functional description into an indexed description prior to transmission.

34. A method for compressing arbitrary graphical data as claimed in claim 32, wherein said arbitrary graphical data is received as a representation selected from a polygonal graphic representation, a point cloud representation and an ordered piecewise linear mesh

35. A method for compressing arbitrary graphical data as claimed in claim 32, wherein said analyzing said arbitrary graphical data into constituent geometrical parts comprises pattern matching.

36. A method for compressing arbitrary graphical data from a first computer as claimed in claim 32, wherein said describing comprises representing by functional representation.

37. A method for compressing arbitrary graphical data as claimed in claim 32, wherein said arbitrary geometrical data comprises a plurality of data points.

38. A method for compressing arbitrary graphical data as claimed in claim 32, wherein said describing comprises matching with a predetermined shape.

39. A method for compressing arbitrary graphical data as claimed in claim

38, wherein said matching with a predetermined shape comprises matching with a shape selected from a group comprising: lines, curves, planar freeform surfaces, surfaces of revolution, spherical faces, conical faces, cylindrical faces, torroidal faces, ruled surfaces, extrusion surfaces and sweep surfaces and additive combinations thereof.

40. A method for compressing arbitrary graphical data as claimed in claim 38, wherein said matching further comprises modifying said predetermined shape by trimming.

41. A method for compressing arbitrary graphical data as claimed in claim 32, wherewith said compressing comprises encoding as a label and parameters.

42. A method for compressing arbitrary graphical data as claimed in claim 41, wherewith said encoding further comprises labeling with a label selected from a predetermined index of labels.

43. A method for decompressing a functional description of graphical data, said functional description being in terms of basic shapes and associated parameters, the method comprising:

evaluating said functional description in terms of said plurality of basic

geometrical shapes, and

generating geometric entities using said evaluation.

44. A method for decompressing a functional description of graphical data as claimed in claim 43, wherein said generating comprises converting said evaluated functional format into a piecewise linear surface approximation.

45. A method for decompressing a functional description of graphical data as claimed in claim 44, further comprising converting said piecewise linear surface approximation into polygonal geometry.

46. A graphical data-compressor for compression of received, arbitrary graphical data for subsequent transmission; said graphical data-compressor comprising

an input for reception of said received arbitrary graphical data,

an analyzer linked to said input and operable for analysis of said received arbitrary graphical data into constituent geometrical parts,

a scene describer, linked to said analyzer for description of at least some of said constituent geometrical parts as a functional description of said received arbitrary graphical data, and

a geometrical part compressor operatively associated with said scene describer and said analyzer, for reduction of constituent geometric

parts not described by said describer, into a reduced quantity of data.

47. A graphical data compressor according to claim 46 wherein said geometrical part is expressable as at least one spline having knots and wherein said geometrical part compressor comprises a knot remover for identifying and removing knots having no effect on reproduction of the part.

48. A graphical data compressor according to claim 46, wherein said geometrical part is expressable as at least one spline having knots, the geometrical part compressor having a pattern identifier for identifying patterns of knots and an indexer for replacing each identified pattern with an index.

49. A graphical data compressor according to claim 46, the geometrical part compressor comprising a least squares approximator reducing said geometrical part into a least squares approximation.

50. A graphical data compressor according to claim 46, the geometrical part compressor having a degree of reduction identifier for identifying redundancy and a reducer for reducing said object to give a minimal polynomial degree required for correct reproduction of said part.